flexible contact element substantially returns to the original shape when the flexibl contact element are withdrawn from contacting the electronic device.

59. (Added) A probe card according to claim 45 wherein said freestanding flexible conductors deflect away from the original shape when said freestanding flexible conductors electronic components; the freestanding flexible conductors substantially return to the original shape when the flexible contact elements are withdrawn from contacting the electronic component.

60. (Added) A probe card according to claim 49 wherein said freestanding flexible conductors deflect away from the original shape when said freestanding flexible conductors electronic components; the freestanding flexible conductors substantially return to the original shape when the flexible contact elements are withdrawn from contacting the electronic component.

REMARKS

Reconsideration is respectfully requested in view of any changes to the claims and the remarks herein. Please contact the undersigned to conduct a telephone interview in accordance with MPEP 713.01 to resolve any remaining requirements and/or issues prior to sending another Office Action. Relevant portions of MPEP 713.01 are included on the signature page of this amendment.

Support for the added claims is found in the Amendment submitted on September 27, 2001.

Enclosed is the attachment from Van Nostrand's Scientific Encyclopedia referred to in the Amendments submitted September 27, 2001 which was inadvertently left out thereof.

In view of the changes to the claims and the remarks herein, the Examiner is respectfully requested to reconsider the above-identified application. If the Examiner

wishes to discuss the application further, or if additional information would be required, th undersigned will cooperate fully to assist in the prosecution of this application.

Please charge any fee necessary to enter this paper and any previous paper to deposit account 09-0468.

If the above-identified Examiner's Action is a final Action, and if the above-identified application will be abandoned without further action by applicants, applicants file a Notice of Appeal to the Board of Appeals and Interferences appealing the final rejection of the claims in the above-identified Examiner's Action. Please charge deposit account 09-0468 any fee necessary to enter such Notice of Appeal.

In the event that this amendment does not result in allowance of all such claims, the undersigned attorney respectfully requests a telephone interview at the Examiner's earliest convenience

> Where the response to a first complete action includes a request for an interview or a telephone consultation to be initiated by the examiner, ... the examiner, as soon as he or she has considered the effect of the response, should grant such request if it appears that the interview or consultation would result in expediting the case to a final action.

Respectfully submitted,

By: Dr. Daniel P. Morris, Esq.
Reg. No. 32,053

IBM Corporation

VAN NOSTRAND'S SCIENTIFIC ENCYCLOPEDIA

Sixth Edition

Animal Life
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...he best known of which is the plague. Specific kinds of ...

...*flea* (*Pulex irritans*). Frequently bites around the legs and ...y; be 3 or 4 bites in a line. As contrasted with ticks and ...move from one host to the next. This flea also is found ...and commonly breeds in hog houses, as well as on dogs, ..., domestic rats and some wild animals, such as skunks, ...ad badgers. This species is most often found in the Mississippi ...n Texas, and westward to the Pacific Coast.

...*flea* (*Ctenocephalides canis*) and *cat flea* (*C. Felis*) are probably ...t widespread of all fleas and will attack other animals and ...

...*ern rat flea* (*Nosopsyllus* or *Ceratopsyllus fasciatus*, Bosc). This ...curs in the northern United States and it is estimated that ...this species predominate on rats in that region (about 70%).

...*ght flea* (*Echidnophaga gallinacea*). This insect infests poultry ...sionally annoys humans and pets in the southern United ... Young chickens and other poultry are sometimes killed by ...festations.

...*tal rat flea* (*Xenopsylla cheopis*). Although widely distributed ...out the United States, the insect is most abundant in southern ...ts and the southern United States. In these regions, about ... fleas found on rats are of this species. The rat flea is capable ...mitting murine or endemic typhus from rats to humans. This ...known as *Rickettsia typhi*, differs from Old World typhus. ...large percentage of the cases of this disease reported occur ...gions where the oriental rat flea is present. This species also ...s an intermediate for communicating dog tapeworm (*Dipy-... caninum*).

...*ge flea* (*Tunga* or *Dermatophilus penetrans*. Linne). A tiny, ...brown flea found in the West Indies, Mexico, and some of ...uthern United States. This insect, about $\frac{1}{75}$-inch (1 millimeter) ...th, attacks humans, hogs, and domestic animals. Their habits ...e cycle parallel those of other fleas, depending upon animal ...for their existence. They develop in the soil or in filthy debris. ...abundant, this flea can be a severe pest to pigs and dairy animals. ...mans, it tends to penetrate the body by way of the skin between ...d under fingernails, and the wound can be quite painful. The ...oduced frequently becomes infected. The body of the flea must ...moved with sterile instruments. When the female chigoe flea is ...f eggs, she may be as large as a small pea. The chigoe flea ...ust be confused with the chigger, another small and annoying ...ee Chigger.

...*trol Measures*. Malathion, methoxychlor, rotenone, or pyre-... (pyrethrins) are used for killing fleas on dogs and cats. For ...ying fleas in dairy barns and poultry houses, malathion is often ...

...A-BEETLE (*Insecta, Coleoptra*). These insects are found on sev-...rops and tend to be specialists. The *apple flea-beetle* (*Graptodera ...*) is tiny, about $\frac{1}{16}$-inch (5 millimeters) in length or less, of a ...y-green color, and is a leaf feeder. The species *Halticini* attacks ...cabbage, horseradish, potato, and tomato. This beetle is small ...f the jumping type. It attacks the leaves of the plant, producing ...numbers of holes and ultimately destroying the leaves. The *grape-...flea-beetle* (*Graptodera chalybea*) is about $\frac{1}{4}$-inch (6 millimeters) ...gth, is of a blue metallic color, and feeds on buds and tender ...ts of the vine in the spring. Treatment of these beetles is usually ...pplication of chemicals to kill the grubs. Mechanical means of ...ing the vine can also be effective, particularly for comparatively ...l plantings.

...A BITE. Dermatitis and Dermatosis.

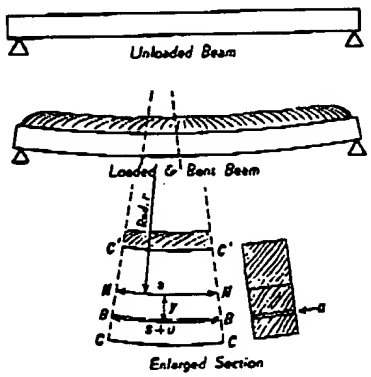
...TCHER-MUNSON CURVES. Loudness Level; Musical ...d.

...XION REFLEXES. Brain and Nervous System.

FLEXURE. Flexure is a term which is used to denote the curved ...nt state of a loaded beam. A horizontally located beam, transversely loaded with vertically directed load, offers an example of load-carrying ability derived through flexure. In flexure, an elastic structural material undergoes a deflection sufficient to set up in its material stresses which will support the load. Deflection under load is an essential and necessary part of the process of load carrying by a beam, for until the deflection has occurred, there are set up in the beam no resisting forces. Thus if an unloaded beam is perfectly straight and horizontal, it must assume a slightly curved position if any external load is supported by it. The only way in which a loaded beam could be straight would be to have had an initial deflection in a direction opposite to the loading.

The so-called ordinary, or common, flexure theory establishes a relation between the fiber stresses at any point in a beam and the bending moment causing these stresses. This theory is based on two fundamental assumptions. The first assumption is that a cross-section which was a plane before bending remains a plane after bending. This implies that the unit deformations are proportional to the distance from the neutral axis. The second assumption is that the fiber stresses are proportional to the deformations resulting from these stresses. If a tension member is subjected to an axial load in a testing machine it will be found that, for stresses below the proportional limit, the ratio of the unit stress to the unit deformation is a constant called the modulus of elasticity. This would also be true if the test specimen were a short compression member. In order to reconcile the second assumption it must be further assumed that the fibers act similar to test specimens and that the modulus of elasticity is the same for tension and compression.

It will now be shown how deflection and load-carrying ability are interrelated in a beam (see figure). First, it will be assumed that the



Beam unloaded and in flexure.

structural material is elastic, that is, within the elastic limit the stress is proportional to the strain inducing it, and that it is a homogeneous material. The results produced by materials not exactly meeting these specifications are usually in good accord with the theory based on these assumptions.

Assume that there is a beam of rectangular cross-section mounted horizontally between simple supports. If one were further to assume this material is weightless, the axis of the beam would be absolutely horizontal. Next a gravity load is placed on the beam, resulting in a certain deflection which sets up resisting couples within the beam, enabling it to carry the load. It must be evident that after a static condition is reached, the external bending moment thus imposed on the beam must, at any point, be balanced by an internal moment arising out of the stresses in the material of the beam. Next consider the enlarged section of the bent beam. If the section is taken sufficiently small, it can be assumed to be bent in the arc of a circle whose radius is r. The upper fibers, i.e., $C'C'$, are naturally compressed or shortened in length, and the lower, CC, are stretched. At some intermediate plane, NN, there must exist an unstretched fiber whose length

is the same as it possessed in the unloaded state. This axis of no strain is called the neutral axis. If its length is s, then the length of a typical fiber such as BB, located at a distance y from the neutral axis, is $s + u$, in which u represents the stretch, u/s is the percentage stretch, or strain, of the material. From the geometry of the figure it is apparent that the strain $u/s = y/r$. Since stress is proportional to strain, the factor of proportionality being the modulus of elasticity E, it follows that the stress on $BB = f = Ey/r$. Referring to the cross section of this small element of the beam, the end area of fiber BB is taken as a. The stress f acting on this area produces an elementary internal force of af. Above the neutral axis there are similarly produced forces, but oppositely directed. The sum of all these longitudinal forces is, of course, zero, since the beam is static; however, at any cross section they produce, *in toto*, a moment around the neutral axis which is exactly equal to the external bending moment at that section. For example, the moment of the force acting on the fiber BB is afy about the neutral axis. The total moment, then, is the $\Sigma\, afy$ about the neutral axis.

Substituting Ey/r for f the total moment equals

$$\frac{E}{r}\int ay^2 = \frac{E}{r} I$$

The last step shows how the moment of inertia enters into the flexure formula. Since r is not a convenient quantity to work with, a substitution of f/y is made for E/r, resulting in the common flexure formula:

$$f = \frac{My}{I}$$

In this formula, M is the bending moment at a section where the moment of inertia is I, and f is the unit stress at y distance from the neutral axis.

It is readily shown that the neutral axis is coincident with the centroid of the cross section of the beam. From the above, we extract the following equation:

$$af = \frac{E}{r} ay$$

$$\int af = \frac{E}{r}\int ay$$

$\int af$ is the total force within the beam parallel to the neutral axis, and is zero, as explained above, but this results also in $\int ay$ being equal to zero, which can be true only when the distance y is a moment arm around the center of gravity of the cross-sectional area.

The flexure formula is valid as long as the stresses are within the proportional limit and if the neutral axis is a principal axis. For oblique loading, a separate stress is found with respect to each of the two principal axes. These stresses are then combined. In the derivation of this formula it is assumed that the horizontal stresses are the only internal forces which resist the external bending. As a matter of fact, the true maximum tensile or compressive unit stress, called a principal stress, is the resultant of the bending and the shearing stress acting at the point. But, as has been previously stated, the stresses which are obtained by the flexure formula are reasonably correct for ordinary design purposes.

FLEXURE (Section Modulus). Section Modulus.

FLICKER. Woodpeckers and Toucans.

FLICKER SENSITIVITY (Eye). Ferry-Porter Law.

FLIGHT. Aerodynamics; Airplane; Balloon; Dirigibles and Airships; Helicopters and V/STOL Craft; Supersonic Aerodynamics.

FLIGHT (Birds). Birds.

FLIGHT DATA RECORDER. Regulatory agencies of many nations require airline aircraft to be equipped with a flight data recorder and a cockpit voice recorder. These devices record information be vital to the analysis of unusual and unexpected flight circ Hence, these recorders must be protected to withstand seve mental conditions, as may be encountered in accident su flight data recorder shown in the accompanying illustrati

Flight data recorder.

tained within a protective enclosure of heavy steel with layers of insulating and ablative materials. The housing to exceed impacts of 100 g's and a fire of 2,000°F (1093°C) for 30 minutes. The tape portion is designed to pass a 48-hou immersion test. The housing also provides shielding against erasure through short circuits or other random external el rent, producing a magnetic field.

Variables recorded include altitude from −1,000 *feet* fe feet (−305 meters to +15,420 meters); air speed; heading operated from the aircraft compass system through a synchr recording to an accuracy of ±2°, with a system electrically i of the recorder, i.e., powered from the same source as th to eliminate errors; vertical acceleration, with signal obt remotely mounted vertical accelerometers with recording of ±0.2 g; and a timing system which records at one-minu on the edge of the recording medium. The accuracy of t system is not dependent on the tape speed or primary power Additional features include a channel to record aircraft p the vertical gyro and circuitry to record marker beacon sig

The recording medium used is high-tensile-strength stain foil upon which the record is made by engraving a line appr .001 inch (0.025 millimeter) in width. The foil can withs accident environments without need for thermal, mechanic netic protection. The method of engraving prevents the re appearing on the other side of the foil so that simultaneous on both sides of the foil may be made; or the tape may over and used. The tape is contained in an easily replaceable

A separate cockpit voice recorder is of similar overall co and records all voice communications between crew memb flight deck; all voice communications transmitted or receive and all voice communications on the aircraft intercom sy recorder will preserve the last 30 minutes of the crew's voice cations to aid in accident investigation. The record amp oscillator/mixer and monitor are packaged in subassembl plug into the main chassis. Assembly circuit boards are m rugged structure, with point-to-point wiring (in contrast wiring) used throughout. The magnetic tape used is stored removable magazine which fits within the protective en requires no threading or adjustment when installed. The ta within the magazine as a continuous loop; no spools a used. An associated microphone monitor system is mount in the cockpit to pick up crew members' voices. Circuitry